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# ROUGHAGE SUPPLEMENTS

in Rations for Wintering Yearling Cattle

WEST VIRGINIA UNIVERSITY  
AGRICULTURAL EXPERIMENT STATION

## Summary and Conclusions

Three trials with long yearling steers and heifers wintered in the open on pasture were conducted to determine the value of cottonseed oil meal and two complex roughage supplements. The results obtained do not suggest that there was any difference in the value of the supplements fed. The supplements increased the efficiency with which the cattle used the hay fed by at least 20 to 30 percent and decreased the amount of hay needed during the winter feeding period by a corresponding amount while increasing weight gains and general condition. Cattle which did not receive a supplement either maintained or lost weight.

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# Roughage Supplements in Rations for Wintering Yearling Cattle

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RECENT developments in cattle feeding have shown that the nutritional value of a roughage depends to a marked extent upon the performance of billions of microorganisms in the cow's rumen. These microorganisms change feed-cellulose or fiber and other feed components into forms which can be used by the cow. To do this work the microorganisms require certain nutrients for their own reproduction and growth. Roughages, especially those low in quality, are often lacking in one or more of the nutrients required by the microorganisms as well as by cattle. Such roughages, when fed without a supplement, are used inefficiently.

Proteins, minerals, and readily available energy are most often deficient in low-quality roughage. A supplement containing these nutrients should improve the feeding value of the roughage. Such a supplement should make it possible for a feeder to use his winter supply of roughage to best advantage. This would be particularly important when a winter supply of roughage is short.

With these facts in mind, the feeding trials described in this bulletin were conducted to determine the value of different supplements in improving the feeding value of medium- to low-quality roughages fed to yearling cattle during the winter.

## Management of Cattle and Conduct of Trials

Two lots of high-grade, eighteen-month-old Hereford steers and heifers were used in each wintering trial. The cattle were divided on the basis of sex, weight, and breeding so that each lot was as equal in these respects as possible. They were kept on permanent bluegrass-rite clover pastures which provided from one to one-and-one-half acres per head, depending upon the number of cattle available for each trial. The pastures were as nearly equal as possible with respect to grazing, water supply, and wooded areas which provided the only shelter. A mineral mixture consisting of equal parts by weight of iodized salt and calcium phosphate was offered free choice. The hay and supplement

were fed once daily in the morning. The average of three weighings made on the first three and last three days of the feeding period served as the beginning and ending weights.

The compositions of supplements used in these trials, Supplements No. 4 and No. 6, are given in Table 1. In addition, cottonseed oil meal was also used. Because there was no significant difference in performance between the steers and heifers during these trials, the data for the two sexes are presented together.

TABLE 1. COMPOSITIONS OF SUPPLEMENTS

INGREDIENT	SUPPLEMENT NO. 4		SUPPLEMENT NO. 6	
	lbs.	lbs.	lbs.	lbs.
Soybean Oil Meal .....	647.5		547.5	
Alfalfa Meal (Dehydrated) .....	200.0		200.0	
Molasses .....	100.0		100.0	
Ground Corn .....	.....		100.0	
Urea .....	.....		30.0	
Steamed Bone Meal* .....	50.0		50.0	
Vitamin A and D Concentrate** .....	2.5		2.5	
Cost Per Ton .....	\$75.00		\$75.00	

\*Includes one ounce of cobalt sulfate per 100 lbs.

\*\*Vitamin A and D feeding oil guaranteed to contain 4000 I.U. of Vitamin A and 800 I.U. of Vitamin D per pound.

## Results

In Trial I, a medium-quality hay composed of alfalfa and bluegrass was fed. The cattle in Lot 1 were fed all of this roughage they would clean up, or 2.5 lbs. daily per 100 lbs. of live weight. In order to determine the value of cottonseed oil meal as a supplement for this type of roughage, the cattle in Lot 2 received only 80 percent as much hay as the cattle in Lot 1 plus 1.5 lbs. of cottonseed oil meal daily.

The results given in Table 2 show that the cattle which were fed hay alone were just able to maintain their body weight, whereas the cattle which received cottonseed oil meal and hay gained an average of 35 lbs. each during the 112-day feeding period on 20 percent less hay. On this basis, one pound of cottonseed oil meal not only replaced two pounds of hay, but produced one-third pound of gain in body weight per day. Feed costs given in Table 2 show that feeding cottonseed oil meal increased the cost of the daily ration for each animal by 1.4 cents. However, if the value of winter gains are figured at \$15.00 per hundred weight, the net cost of the daily ration for the cattle receiving the cottonseed oil meal supplement is 3.1 cents less than for the cattle fed hay alone. On this basis cottonseed oil meal reduced the winter feed cost by \$3.47 per head.

LE 2. VALUE OF COTTONSEED OIL MEAL AS A ROUGHAGE SUPPLEMENT—  
 TRIAL I, (DEC. 7, 1955-MAY 3, 1956) 112 DAYS.  
 (MEDIUM-QUALITY BLUEGRASS-ALFALFA HAY)

ion	Lot No. 1		Lot No. 2	
	Hay	Cottonseed Oil Meal	Hay,	Cottonseed Oil Meal
Cattle	8 steers, 7 heifers		8 steers, 6 heifers	
Initial Wt. Lb.	723.0		729.0	
Ending Wt. Lb.	724.6		764.0	
Final Gain Per Head Lb.	1.6		35.0	
<i>Average Daily Ration</i>				
Hay, lbs.	17.5		14.5	
Cottonseed Oil Meal lbs.	....		1.5	
Cost*	26.3¢		27.7¢	
Cost**	26.1¢		23.0¢	

\*Cost of average daily ration is based upon the following figures: Hay-\$0.90 per ton and cottonseed oil meal-\$4.00 per hundred weight.

\*\*Net cost of average daily ration equals feed cost per day plus or minus value of weight change with cattle valued at \$15.00 per hundred weight.

## Trial II

The hay available for feeding in Trial II was mainly bluegrass mixed with cheat and foxtail. As the quality of this hay appeared to be much poorer than that of the hay fed during the first trial, it was felt that a more complete supplement would be necessary to supply the nutrients lacking in the hay. Accordingly, Supplement No. 4 was designed to supply a variety of nutrients which would normally be expected to be deficient in a very poor quality hay. The composition of this supplement is given in Table 1.

As in the first trial, the cattle in Lot 1 were allowed to eat all the hay they desired or an average of 13 lbs. per head daily, and those in Lot 2 were fed only 80 percent as much as Lot 1 or an average of 10.3 lbs. per head daily. In addition to the hay, cattle in Lot 2 received 1.75 lbs. of Supplement No. 4 per head daily.

Results of this trial given in Table 3 show that the cattle in Lot 1, which received hay alone, lost an average of 8 lbs. during the 92-day feeding period. On the other hand, cattle in Lot 2, which received 80 percent as much hay as those in Lot 1 plus the supplement, gained an

TABLE 3. THE VALUE OF SUPPLEMENT NO. 4 IN IMPROVING ROUGHAGE UTILIZATION--

TRIAL II—(DEC. 8, 1955-MAR. 4, 1956) 92 DAYS.  
(BLUEGRASS, CHEAT AND FOXTAIL)

	Lot. No. 1	Lot No. 2
Ration	Hay	Hay, Supp. No. 4
No. Cattle	9 steers, 7 heifers	10 steers, 7 heifers
Av. Initial Wt. lbs.	677	675
Av. Final Wt. lbs.	669	711
Total Gain per head lbs.	-8.0	36.0
<i>Average Daily Ration</i>		
Hay, lbs.	13.0	10.3
Supplement No. 4, lbs.	....	1.75
Cost*	19.5¢	22.0¢
Net Cost**	20.8¢	16.1¢

\*Cost of average daily ration is based upon the following figures: Hay-0.00 per ton and Supplement No. 4-\$3.75 per hundred weight.

\*\*Net cost of average daily ration equals feed cost per day plus or minus the value of weight change with cattle valued at \$15.00 per hundred weight.

average of 36 lbs. each during the same period. The feed prices given in Table 3 show that the average daily feed cost for cattle in Lot 1 was 19.5 cents and for the cattle in Lot 2, 22.0 cents per head. If the values of gains or losses in body weight are considered at 15 cents per pound, as was the case in Trial 1, the net average daily feed cost per head for the supplement-fed group was 16.1 cents, 4.7 cents less than the cost of the average daily ration of the cattle fed hay alone.

It is quite probable the difference in net feed cost between the two lots would have been even more in favor of the cattle receiving the supplement if the feeding period had been of the usual length of about 150 days. The average daily gain of almost 0.4 lbs. during the 92-day feeding period is considered to be very satisfactory for wintering yearling cattle, especially in view of the amount and quality of roughage which was fed.

### TRIAL III

Trial III was conducted to compare cottonseed oil meal and Supplement No. 6. In this trial the roughage fed was limited to 1.5 lbs. daily per 100 lbs. of body weight. This was equal to 70 percent as much

TABLE 4. THE COMPARATIVE VALUE OF COTTONSEED OIL MEAL AND  
SUPPLEMENT NO. 6 AS ROUGHAGE SUPPLEMENTS—  
TRIAL III—(DEC 8, 1955-MAY 2, 1956) 149 DAYS.  
(MEDIUM-QUALITY FIRST-CUTTING ALFALFA-WEEDY)

	Lot. No. 1	Lot No. 2
Hay,		
Cottonseed Oil Meal Hay, Supp. No. 6		
Cattle	13 steers, 11 heifers	12 steers, 12 heifers
Initial Wt. lbs.	768.5	711.0
Ending Wt. lbs.	795.0	735.0
Total Gain per head, lbs.	26.5	24.0
Average Daily Ration		
Hay, lbs.	10.3	10.3
Cottonseed Oil Meal	1.0	1.0
Supplement No. 6		
Cost*	22.0¢	21.8¢
Net Cost**	19.3¢	19.4¢

\*Cost of average daily ration is based upon the following figures: Hay-\$35.00 per ton, cottonseed oil meal-\$4.00 per hundred weight, and Supplement No. 6-\$3.00 per hundred weight.

\*\*Net cost of average daily ration equals feed cost per day plus or minus the cost of weight changes with cattle at \$15.00 per hundred weight.

as was eaten by the Lot 1 cattle in Trial I which ate all of the hay they wanted. On this basis, both lots of cattle in Trial III were given an average of 10.3 pounds daily of a medium-quality first-cutting alfalfa hay. In this trial it was not possible to balance the beginning weights of the two lots and at the same time have them as equal in sex and breeding as was desired. As a result, the average beginning weight of the cattle in Lot 1 was 57.5 lbs. greater than that of the cattle in Lot 2. It is not felt that this difference in beginning weight influenced the outcome of the trial.

In addition to the hay, cattle in Lot 1 received one pound of cottonseed oil meal, whereas cattle in Lot 2 received one pound of Supplement No. 6 per head daily. The composition of Supplement No. 6 is given in Table 1.

As shown in Table 4 the average gains in body weight made by cattle in both lots during the 149-day feeding period were very close, 26 pounds and 24 pounds for Lots 1 and 2, respectively. Although, the

cattle receiving cottonseed oil meal made a little better gain, the cost of the oil meal was slightly more per pound than the cost of Supplement No. 6, so that the net cost of the gain for the two lots of cattle was practically identical. It is believed, however, that with a poor quality roughage, such as straw or the hay fed in Trial II, Supplement No. 6, because of its content of a variety of nutrients, would be superior to cottonseed oil meal.

## Discussion

The supply of roughage available for winter feeding may be insufficient for any one of a number of reasons beyond a feeder's control. It is likely that when such conditions exist other feeders in the same area are faced with the same problem. When such is the case, it is often difficult to purchase hay at a reasonable price. The results of the winter feeding trials clearly demonstrate that a feeder may profitably extend his supply of roughage by feeding a good supplement. As indicated by the results of these trials, feeding a supplement reduced the roughage needed to bring cattle through the winter in good shape 20 to 30 percent, depending upon the quality of roughage fed, or, in other words, by feeding a supplement, 100 head can be wintered on the same quantity of hay needed to winter 70 to 80 head if only hay is fed. Also, even though the supply of roughage may be adequate but of very poor quality, it is possible to bring the cattle through the winter in better condition and obtain greater nutritional value from the roughage fed if a supplement is used.

As would be expected, the improved gain obtained in these trials by feeding the different supplements with limited amounts of roughage was not great enough to influence the weight of the cattle at the end of the following grazing season. If the cattle had been fed all the roughage they could eat in addition to a supplement, winter gains would have undoubtedly been greater. Such economical gains may be of value if a feeder plans to sell his cattle for slaughter before the end of the grazing season or when grain is to be fed on pasture so as to permit early marketing. It is also possible that gains made economically with low-quality roughage and supplement will be to a feeder's advantage if he intends to sell his cattle at the end of the winter feeding period. The wintering of yearling heifers which are to be bred to calve as two-year-olds would be another situation in which the added gains and improved condition resulting from supplementing low-quality roughage would be well worthwhile.



